

239005

STATE OF SOUTH CAROLINA

BEFORE THE
PUBLIC SERVICE COMMISSION
OF SOUTH CAROLINA

COVER SHEET

(Caption of Case)

In Re: Petition of South Carolina Electric & Gas
Company for Updates and Revisions to Schedules
Related to the Construction of a Nuclear Base Load
Generation Facility at Jenkinsville, South Carolina

DOCKET

NUMBER: 2012 - 203 - E

(Please type or print)

Submitted by: Robert Guild
Attorney at Law

SC Bar Number: 2358

Address: 314 Pall Mall

Telephone: 803 252 1419Columbia, SC 29201Fax: 803 252 1419

Other: _____

Email: bguild@mindspring.com

NOTE: The cover sheet and information contained herein neither replaces nor supplements the filing and service of pleadings or other papers as required by law. This form is required for use by the Public Service Commission of South Carolina for the purpose of docketing and must be filled out completely.

DOCKETING INFORMATION (Check all that apply)

☐ Emergency Relief demanded in petition ☐ Request for item to be placed on Commission's Agenda expeditiously

☐ Other: _____

INDUSTRY (Check one)	NATURE OF ACTION (Check all that apply)		
<input checked="" type="checkbox"/> Electric	<input type="checkbox"/> Affidavit	<input type="checkbox"/> Letter	<input type="checkbox"/> Request
<input type="checkbox"/> Electric/Gas	<input type="checkbox"/> Agreement	<input type="checkbox"/> Memorandum	<input type="checkbox"/> Request for Certification
<input type="checkbox"/> Electric/Telecommunications	<input type="checkbox"/> Answer	<input type="checkbox"/> Motion	<input type="checkbox"/> Request for Investigation
<input type="checkbox"/> Electric/Water	<input type="checkbox"/> Appellate Review	<input type="checkbox"/> Objection	<input type="checkbox"/> Resale Agreement
<input type="checkbox"/> Electric/Water/Telecom.	<input type="checkbox"/> Application	<input type="checkbox"/> Petition	<input type="checkbox"/> Resale Amendment
<input type="checkbox"/> Electric/Water/Sewer	<input type="checkbox"/> Brief	<input type="checkbox"/> Petition for Reconsideration	<input type="checkbox"/> Reservation Letter
<input type="checkbox"/> Gas	<input type="checkbox"/> Certificate	<input type="checkbox"/> Petition for Rulemaking	<input type="checkbox"/> Response
<input type="checkbox"/> Railroad	<input type="checkbox"/> Comments	<input type="checkbox"/> Petition for Rule to Show Cause	<input type="checkbox"/> Response to Discovery
<input type="checkbox"/> Sewer	<input type="checkbox"/> Complaint	<input type="checkbox"/> Petition to Intervene	<input type="checkbox"/> Return to Petition
<input type="checkbox"/> Telecommunications	<input type="checkbox"/> Consent Order	<input type="checkbox"/> Petition to Intervene Out of Time	<input type="checkbox"/> Stipulation
<input type="checkbox"/> Transportation	<input type="checkbox"/> Discovery	<input checked="" type="checkbox"/> Prefiled Testimony	<input type="checkbox"/> Subpoena
<input type="checkbox"/> Water	<input checked="" type="checkbox"/> Exhibit	<input type="checkbox"/> Promotion	<input type="checkbox"/> Tariff
<input type="checkbox"/> Water/Sewer	<input type="checkbox"/> Expedited Consideration	<input type="checkbox"/> Proposed Order	<input type="checkbox"/> Other: <i>OK OK</i>
<input type="checkbox"/> Administrative Matter	<input type="checkbox"/> Interconnection Agreement	<input type="checkbox"/> Protest	
<input type="checkbox"/> Other:	<input type="checkbox"/> Interconnection Amendment	<input type="checkbox"/> Publisher's Affidavit	

ROBERT GUILD

Attorney at Law

314 Pall Mall • Columbia, South Carolina 29201 • 803-252-1419

September 6, 2012

Ms. Jocelyn Boyd
Chief Clerk
Public Service Commission of South Carolina
Post Office Drawer 11649
Columbia, SC 29211

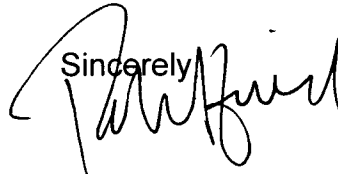
RECEIVED
2012 SEP - 6 PM 3:16
SC PUBLIC SERVICE
COMMISSION

In Re: Petition of South Carolina Electric & Gas Company for Updates and Revisions to
Schedules Related to the Construction of a Nuclear Base Load Generation
Facility at Jenkinsville, South Carolina
Docket No. 2012-203-E

Dear Ms. Boyd::

Enclosed please find for filing and consideration the Surrebuttal Testimony and
Exhibits of Dr. Mark Cooper on behalf of the Sierra Club in the above docket, together
with Certificate of Service reflecting service upon all parties of record.

With kind regards I am

Sincerely

Robert Guild

Encl.s
CC: All Parties

CERTIFICATE OF SERVICE

I hereby certify that on this date I served the above SURREBUTTAL TESTIMONY AND EXHIBITS OF DR.MARK COOPER by placing copies of same in the United States Mail, first-class postage prepaid, addressed to:

Scott Elliott , Counsel
Elliott & Elliott, P.A.
721 Olive Street
Columbia, SC, 29205

Courtney Dare Edwards , Counsel
Jeffrey M. Nelson. Counsel
Office of Regulatory Staff
1401 Main Street, Suite 900
Columbia, SC, 29201

Belton T. Zeigler , Counsel
Gary Pope, Jr., Counsel
Pope Zeigler, LLC
Post Office Box 11509
Columbia, SC, 29211

K. Chad Burgess , Associate General Counsel
Matthew W. Gissendanner, Senior Counsel
South Carolina Electric and Gas Company
MCC 222
220 Operation Way
Cayce, SC 29033-3701

Pamela Greenlaw
1001WotanRoad
Columbia,SC,29229

September 6, 2012



Robert Guild
314 Pall Mall
Columbia, South Carolina 29201

RECEIVED
2012 SEP -6 PM 3:16
SC SUREBUTTAL SERVICE
DIVISION

STATE OF SOUTH CAROLINA**(Caption of Case)****In Re: Petition of South Carolina Electric & Gas
Company for Updates and Revisions to Schedules
Related to the Construction of a Nuclear Base Load
Generation Facility at Jenkinsville, South Carolina****BEFORE THE
PUBLIC SERVICE COMMISSION
OF SOUTH CAROLINA****COVER SHEET****DOCKET****NUMBER: 2012 - 203 - E**

(Please type or print)

**Submitted by: Robert Guild
Attorney at Law****SC Bar Number: 2358****Address: 314 Pall Mall
Columbia, SC 29201****Telephone: 803 252 1419****Fax: 803 252 1419****Other: _____****Email: bguild@mindspring.com**

NOTE: The cover sheet and information contained herein neither replaces nor supplements the filing and service of pleadings or other papers as required by law. This form is required for use by the Public Service Commission of South Carolina for the purpose of docketing and must be filled out completely.

DOCKETING INFORMATION (Check all that apply)☐ **Emergency Relief demanded in petition** ☐ **Request for item to be placed on Commission's Agenda expeditiously**☐ **Other: _____**

INDUSTRY (Check one)	NATURE OF ACTION (Check all that apply)		
<input checked="" type="checkbox"/> Electric	<input type="checkbox"/> Affidavit	<input type="checkbox"/> Letter	<input type="checkbox"/> Request
<input type="checkbox"/> Electric/Gas	<input type="checkbox"/> Agreement	<input type="checkbox"/> Memorandum	<input type="checkbox"/> Request for Certification
<input type="checkbox"/> Electric/Telecommunications	<input type="checkbox"/> Answer	<input type="checkbox"/> Motion	<input type="checkbox"/> Request for Investigation
<input type="checkbox"/> Electric/Water	<input type="checkbox"/> Appellate Review	<input type="checkbox"/> Objection	<input type="checkbox"/> Resale Agreement
<input type="checkbox"/> Electric/Water/Telecom.	<input type="checkbox"/> Application	<input type="checkbox"/> Petition	<input type="checkbox"/> Resale Amendment
<input type="checkbox"/> Electric/Water/Sewer	<input type="checkbox"/> Brief	<input type="checkbox"/> Petition for Reconsideration	<input type="checkbox"/> Reservation Letter
<input type="checkbox"/> Gas	<input type="checkbox"/> Certificate	<input type="checkbox"/> Petition for Rulemaking	<input type="checkbox"/> Response
<input type="checkbox"/> Railroad	<input type="checkbox"/> Comments	<input type="checkbox"/> Petition for Rule to Show Cause	<input type="checkbox"/> Response to Discovery
<input type="checkbox"/> Sewer	<input type="checkbox"/> Complaint	<input type="checkbox"/> Petition to Intervene	<input type="checkbox"/> Return to Petition
<input type="checkbox"/> Telecommunications	<input type="checkbox"/> Consent Order	<input type="checkbox"/> Petition to Intervene Out of Time	<input type="checkbox"/> Stipulation
<input type="checkbox"/> Transportation	<input type="checkbox"/> Discovery	<input checked="" type="checkbox"/> Prefiled Testimony	<input type="checkbox"/> Subpoena
<input type="checkbox"/> Water	<input checked="" type="checkbox"/> Exhibit	<input type="checkbox"/> Promotion	<input type="checkbox"/> Tariff
<input type="checkbox"/> Water/Sewer	<input type="checkbox"/> Expedited Consideration	<input type="checkbox"/> Proposed Order	<input type="checkbox"/> Other:
<input type="checkbox"/> Administrative Matter	<input type="checkbox"/> Interconnection Agreement	<input type="checkbox"/> Protest	
<input type="checkbox"/> Other:	<input type="checkbox"/> Interconnection Amendment	<input type="checkbox"/> Publisher's Affidavit	

1 **BEFORE THE**
2 **SOUTH CAROLINA PUBLIC SERVICE COMMISSION**
3 **SURREBUTTAL TESTIMONY**
4 **OF**
5 **DR.MARK COOPER**
6 **ON BEHALF OF THE SIERRA CLUB**
7 **DOCKET NO. 2012-203-E**
8

RECEIVED
2012 SEP -5 PM 3:17
SOUTH CAROLINA
PUBLIC SERVICE
COMMISSION

9 **Q. Please state your name and address.**

10 **A. My name is Dr. Mark Cooper. I reside at 504 Highgate Terrace, Silver Spring, Maryland.**
11

12 **Q. Are you the same Mark Cooper who is providing direct testimony in this**
13 **proceeding?**

14 **A. Yes, I am.**
15

16 **Q. What is the purpose of your surrebuttal testimony?**

17 **A. My testimony responds to the rebuttal testimony of the company witnesses, showing that**
18 **they have misrepresented my analysis and recommendations and failed to provide the**
19 **Commission with any evidence that it is prudent to continue incurring costs for the V.C. Summer**
20 **units 2 & 3.**
21

22 **Q. Do you agree with Company witness Byrne's the claim (p. 1)¹ that your testimony**
23 **has several inaccuracies and misunderstandings?**

¹ All page references are to the Company witness rebuttal testimony, unless otherwise noted.

1 A. Not at all. There are differences of opinion between myself and the company about what
2 the company has done and should do in a cost recovery proceeding and misrepresentations or
3 misinterpretations of my testimony, none of which cast any doubt on my analysis or my
4 recommendation to the Commission that the company should be required to do a full blown
5 evaluation of the prudence of continuing the nuclear project by comparing it to other alternatives.
6

7 **Q. Do you agree with company witness March's (p. 4) statement that you are engaging**
8 **in some "sort of ex post facto review of the decision to construct nuclear generation?"**

9 A. Absolutely not. The Baseload Review Act (BLRA) did not give the utility a blank check.
10 The Commission has the obligation to review cost overruns. This is an ex ante review.
11 Moreover, my recommendation of an examination of "to go" costs to be compared with the cost
12 of alternatives under current market conditions is explicitly an ex ante view and exactly what
13 prudent actors must do in a competitive market. Prudence in the marketplace is a potent, vigilant
14 disciplinary force that requires constant evaluation of projects. Moreover, I have stated that the
15 review of current options must recognize that the sunk costs are included in the overall
16 comparison, which avoids exactly the charge of being an unfair, "ex post facto," analysis. The
17 utility is absolutely wrong if it thinks that the BLRA requires the Commission to pass through
18 every cost overrun or to allow the utility to complete the project, no matter how large the cost
19 overruns are. The utility is absolutely wrong if it believes that once it identified possible risks
20 (Marsh, p. 9), the Commission could not conclude that the risks have broken so badly against the
21 projects that it is no longer worth the rewards.
22

23 **Q. Do you stand by your statement that the EPC was a rush to judgment?**

1 **A.** Yes. The company objects to my characterization of the EPC as a rush to judgment by
2 citing its reporting on the progress of the project. The cost overruns that the company is seeking
3 to recover from ratepayers is one clear indication that the project is not humming along. The
4 cost overruns are the result of rushing to get at the head of the line.

5 The primary rationale for signing the EPC early offered in the risk assessment that Mr.
6 Byrne attaches to his rebuttal testimony has evaporated as the bubble of the nuclear renaissance
7 burst. Rather than a rush of orders (p. 1, 3, 6), which the utility considered a threat to increase
8 costs, there has been a mass abandonment of projects, including the reference design project
9 (p.2). Design revisions have increased by almost one third (p. 2). Licensing has been delayed
10 because of substantive design problems (p. 3-4). The availability of qualified personnel has
11 clearly been a problem (p. 6), as have manufacturing and quality issues (p. 7). The collaborative
12 effort to defray the cost of completing the design has collapsed. These are the difficulties that
13 have led to an increase in the cost estimate. Being first in line will cost ratepayers dearly. Given
14 the collapse of the nuclear renaissance, if anyone were ordering new reactors toady, they might
15 get a lower cost because demand is so slack and the early reactors have borne the brunt of the
16 learning costs, but the economics of new nuclear construction has turned so sour that new orders
17 are not being placed.

18
19 **Q.** **What does the company rebuttal show about the prudence of passing through the**
20 **cost overruns requested in this proceeding?**

21 **A.** One thing the company rebuttal testimony makes abundantly clear is that the company
22 has failed and refuses to ask the key question that must be asked – is the project still prudent
23 going forward?

1 Presenting quarterly reports that show progress down a chosen path is not the analysis
2 that is needed to ensure that the utility is acting prudently. This is exactly the myopic tunnel
3 vision thinking that preapproval and advanced cost recovery creates. Management must raise its
4 eyes up and look at the landscape not just keep plowing ahead.

5 The rebuttal testimony points back to the 2008 analysis of options (March, p. 4, Lynch
6 12), but with massive changes in a host of material facts that affect the economic situation, that
7 will not do, as I showed in my direct testimony.

8 The company witnesses admit that they have not calculated the costs of terminating the
9 EPC contract. Byrne 13-14, says the cost “could be material.” The utility should know and the
10 Commission needs to know what they are, so they can be compared to the cost savings that
11 would result from switching to less costly ways to meet the need for electricity. With three
12 quarters of the costs yet to be incurred, now is the moment to have a full review of the prudence
13 of the project.

14 The company response to my calculation of the change in natural gas costs and the
15 current landscape with respect to carbon policy is to suggest that adjustments to the nuclear cost
16 estimates would offset my adjustments to the natural gas cost estimate (Lynch, p. 11-12). In my
17 opinion they have botched and misrepresented the comparison, but the important point is that the
18 Commission needs a new economic analysis of the going forward costs to ascertain whether
19 continuing the project is prudent. The company has not provided that analysis.

20 Given the history of the industry and the nature of the risk the project faced, the company
21 did a poor job of estimating costs, which is why it has come back in for approval of two major
22 cost overruns. I believe that many of those overrun costs should have been anticipated and
23 included in the original cost projection and should, therefore, not be recovered from ratepayers.

1 Even if it could be demonstrated that each of the individual costs increases is necessary
2 for the execution of the project, that is all the more reason to re-examine the prudence of the
3 project itself. If the company had properly reflected the risks in its initial cost estimate, the
4 Commission might well have found it not prudent in the first place. Given the statute, the sunk
5 costs must be recovered, but with three-quarters of the costs not yet incurred and in the face of a
6 second major cost overrun, now is the time to re-examine the prudence of the project itself.
7

8 **Q. Why do you say the company has botched and misrepresented the comparison?**

9 **A.** There are two reasons. First, in my testimony I pointed out that my analysis was based
10 only on fuel and carbon cost differences. I noted that the reduction in escalation as a result of
11 general economic conditions would apply to non-fuel costs for the gas plant. The company
12 projects a significant reduction in those non-fuel costs of nuclear construction and compares that
13 to my estimated natural gas fuel cost savings. The company points out that fuel costs are a larger
14 part of total gas costs than fuel costs are of nuclear. However, the company's own estimate
15 shows that non-fuel costs are still important in the total gas cost. For nuclear, fuel costs are 13%
16 of total costs, while for gas fuel is 41% of gas costs (Marsh, p. 7). If we assume that the non-fuel
17 component of gas generation has enjoyed a similar reduction due to the general economic
18 conditions, the proportionate reduction in revenue requirement for the non-fuel component
19 would be about \$200 million, as described in Attachment MNC-SR-1. Combining the fuel and
20 non-fuel cost savings from natural gas, compared to nuclear, gas would still beat nuclear by a
21 wide margin. The economic advantage of gas could more than offset the sunk costs that the
22 utility is allowed to recover, leaving the ratepayers better off as a result of the decision to
23 abandon the project.

1 **Q. What is the second way the company botched and misrepresented the comparison?**

2 **A.** In my opinion the company has double discounted my calculation of the natural gas
3 savings. This vastly underestimates the value to ratepayers of a reduction in natural gas fuel
4 costs. My testimony made it absolutely clear that the base for my estimation of cost savings
5 were costs that were already discounted. Exhibit MNC-SR-2 shows the two pieces of analysis I
6 relied on for my estimates. They are clearly labeled as levelized. I also show the definition of
7 levelized used by the EIA, which shows that the fundamental concept includes real, discounted
8 prices.

9 More importantly, the company concedes that gas prices have declined by 60 percent
10 (Lynch, p. 3), which is the number I used in my analysis. Senior management at a major utility
11 should be well aware of the impact of such a huge reduction in natural gas costs on the revenue
12 requirement. It is generally understood by anyone who knows anything about the electricity
13 business in today's market that a reduction of natural gas prices of over \$10 per mmbtu over a 40
14 year period could not possibly result in only \$35 million per year reduction in levelized, present
15 value revenue requirements. My original estimate was right on the mark.

16 There is no doubt that gas beats nuclear today and is likely to do so for the foreseeable
17 future, which is the primary reason that so many firms have abandoned their flirtation with the
18 construction of new nuclear reactors, as I showed in my Direct Testimony. In fact, the advantage
19 of gas was demonstrated in South Carolina by the action of Santee Cooper, the partner who is
20 trying to reduce its share in the Summer 2 & 3 project, when it offered to contract for electricity
21 generated by another utility with natural gas and pass those costs through to an aluminum plant
22 in its service territory (as reported in Tony Bartelme, " A Year after Alcoa's threat, documents
23 reveal negotiations between Alcoa and Santee Cooper to keep the smelter going," *Post Courier*,

1 September 2, 2012). The deal is short term, but it does demonstrate the immense advantage that
2 natural gas fired generation has compared to the embedded cost of generation, not to mention the
3 much higher costs of new nuclear reactors.

4 In my opinion the cost advantage of natural gas would be more than adequate to
5 compensate for the sunk costs of this nuclear project that must be borne. The rebuttal and
6 surrebuttal testimony make it all the more urgent that the Commission require the company to do
7 a complete, bottom-up cost analysis before these cost overruns are approved and more costs are
8 sunk in a project that is totally uneconomic in the conditions of today's market.

9
10 **Q. How do you respond to the company's claim that the cost of the reactor has gone**
11 **down?**

12 **A.** I have two responses.

13 First, the company is playing a game of "heads I win, tails you lose" with ratepayers. If
14 escalation pushes costs up, the ratepayers pay. If escalation lowers costs, the company finds
15 excuses to keep the money. Ratepayers are paying more than they should for the reactor.

16 Second, the cost of gas has gone down a lot more, so ratepayers are paying too much for
17 the wrong technology.

18
19 **Q. Is the criticism of your discussion of alternatives correct?**

20 **A.** No. The claim that my view of natural gas contradicts that of the Sierra Club is wrong
21 for two reasons.

22 First, natural gas is the alternative the company chose as the base case. I have accepted it
23 and shown that on the company's own terms, the choice of nuclear is not prudent today.

1 Demonstrating that current conditions lead to the conclusion that nuclear is not the preferred
2 option on the company's own terms is the first step in demonstrating that a careful and thorough
3 prudence review is necessary. I made it clear in my testimony that it is not the last step.

4 Second, the company has leapt from my demonstration that gas beats nuclear to the
5 conclusion that I believe gas is the right choice. They combine this erroneous assumption with
6 the observation that my clients in this case have expressed concerns about natural gas to claim
7 that there is an inconsistency between my position and theirs. Nothing could be farther from the
8 truth. This is another example of the failure of the company to do careful analysis of the facts.

9 Exhibits MNC SR-3 and SR-4 show the results of two recent analyses I have presented
10 where I apply a multi-criteria approach to a full range of over a dozen alternatives. I conclude
11 that there are several alternatives that are superior to gas. This is based on national average data.
12 I believe such an analysis should be conducted in the thorough prudence review that Commission
13 orders in this proceeding.

14 Moreover, a review of the Sierra Club's published "Energy Resource Policy" cited by the
15 company's witness Marsh, confirms that the Club's policy position is fully consistent with my
16 analysis.

17 The text accompanying my Exhibit MNC SR-3 reads as follows:

18 Adding the analysis of vagueness to risk and uncertainty as in [the] Exhibit...
19 changes the rankings of several of the resources somewhat although the basic
20 conclusion stands. Efficiency is the most attractive by far. Wind, landfill, hydro
21 and geothermal are also more attractive than gas." (Mark Cooper, "Prudent
22 Resource Acquisition in a Complex Decision Making Environment:
23 Multidimensional Analysis Highlights the Superiority of Efficiency, Current
24 Approaches to Integrated Resource Planning," *2011 ACEEE National Conference*
25 *on Energy Efficiency as a Resource*, Denver, September 26, 2011)
26

27 The text accompanying Exhibit MNC SR-4, reads as follows:

1 [The] Exhibit...combines the ‘new’ ambiguity scale with the traditional core of
2 utility regulation – levelized cost to identify the best path to the future. The route
3 is clear. It begins with efficiency, wind and a mix of other renewables, with gas
4 as a complement. It can then proceed on one of two paths, a renewable route that
5 goes through solar and offshore wind, or a fossil fuel path that includes carbon
6 capture and storage. Nuclear is the most unattractive of the resources. (Mark
7 Cooper, “Least-Cost Planning For 21st Century Electricity Supply: Meeting the
8 Challenges of Complexity and Ambiguity in Decision Making,” *MARC Annual*
9 *Meeting*, Rapid City South Dakota, June, 2011)

10 I have expressed concerns about a second dash to gas for exactly the same reasons that
11 the Sierra Club is concerned about it: it undermines and delays the development of more
12 important alternatives on which the electricity sector will inevitably rely. I believe that slowing
13 and delaying the transition away from fossil fuels will raise the ultimate cost of transforming the
14 electricity sector into an efficient, clean 21st century sector. Looking out over the long term to
15 2050, as shown in Exhibit MNC-SR-5, my base case to achieve the goal of carbon reduction did
16 not include gas. I did note its potential role as a complement, but I emphasized the need to
17 develop the alternatives. The text accompanying Exhibit MNC-SR-5 reads as follows.

18 [The] Figure... combines these and several other estimates for efficiency and
19 renewables, using the costs discussed earlier into a “supply” curve. It expresses
20 the quantity of low carbon supply in two forms – billions of kWh and as a
21 percentage of the base case demand in 2050. The 2050 base case demand is
22 projected from the most recent Energy Information Administration projection of
23 demand in 2030 by assuming the same underlying growth rate of demand from
24 2030 to 2050 as EIA assumed between 2010 and 2030. This calculation assumes
25 that all existing low carbon sources of electricity must be replaced in the long-
26 term. In other words, by 2050 there will be an entirely new set of resources
27 meeting the need for electricity, none of which is online today.

28
29 [The] Figure... also shows a case with natural gas assumed to be needed to be
30 integrated with low load factor renewables (wind and solar) on a one-for-one
31 basis. This may not be necessary until higher levels of contribution from wind and
32 solar are reached. Other options, particularly new storage technologies, may also
33 fill this need to balance out low load factor renewables. Nevertheless, the quantity
34 of gas needed to play the balancing role in the alternative supply curve is well
35 within the range of EIA gas projections for 2030, especially when one considers
36 that efficiency will free up a significant quantity of gas for other uses.
37

1 The goals put forward in the climate policy debate put this supply curve in
2 perspective. The current goal is a reduction of more than 80% below 2005 levels
3 by 2050. The interim goal is to achieve about half that reduction by 2030. The
4 least cost efficiency-renewables approach meets the targets for three decades
5 before the more costly central station and renewable alternatives come into play,
6 if they ever do. The efficiency-renewables approach is the cornerstone of the
7 long-term solution and it buys a great deal of time for new technologies to finish
8 the job. (Mark Cooper, *The Economics of Nuclear Reactors: Renaissance of*
9 *Relapse*, Institute for Energy and the Environment, Vermont Law School, June
10 2009

11
12 **Q. Do your analyses take the variability of natural gas prices into account?**

13 **A.** Yes they do. The ambiguity measure on the X-axis in Exhibit MNC-SR-2 and MNC-SR-
14 3 is a composite index of several sources of variability. In fact, the overall approach, that I call
15 multi-criteria portfolio analysis, is based on portfolio analysis from the financial sector.
16 Investments are evaluated by estimating profits and considering the variability of profits. In the
17 utility sector, the analysis of efficient alternative resources for inclusion in portfolios to meet
18 electricity needs are evaluated by plotting the projected price against the variability of costs,
19 measured as the standard deviation of fuel costs, as shown in Exhibit MNC-SR-6. The analysis
20 identifies an efficient frontier, defined by natural gas. Alternatives that fall below the efficient
21 frontier are attractive because they reduce risk or cost and the portfolio that produces the lowest
22 expected risk-adjusted cost would be made up of those resources. On the simple measure of
23 risk-adjusted cost or the more complex multi-criteria analysis, there are several alternatives that
24 are preferable to natural gas. This analysis shows that building a new nuclear reactor, which is
25 the not the least cost approach even in the narrow company framework would be even less
26 attractive in the multi-criteria approach.

27
28 **Q. Did your direct testimony address this variability?**

1 A. Although I did not present a formal risk-cost trade off, in my analysis I showed that the
2 EIA estimates for natural gas were quite close to the current prices on Nymex. I also showed
3 that the great volatility in natural gas prices appears to be the exception, rather than the rule. In
4 the end I used a point estimate to compare to the base case point estimate the company relied on
5 in its decision matrix. I showed how the lower price of gas would shift the terrain of the
6 decisions space (MNC-4). Much more detail and a more systematic approach should be included
7 in the prudence review that I have recommended.

8
9 **Q. Do you believe that the company should engage in multi-dimensional analysis?**

10 A. I certainly do, as my quotes above show. I do not recommend single factor analysis,
11 although even a uni-dimensional analysis would be better than the no-dimensional analysis the
12 company has presented. Moreover, I believe the consideration of factors other than cost should
13 be done in a systematic approach I call multi-criteria analysis.

14
15 **Q. The above quotes suggest that efficiency can play an important part in meeting the long
16 term need for electricity, but the company says it cannot do more, why do you disagree?**

17 A. The issue of the cost and potential supply from alternatives belongs in a full prudence
18 review, which will show the company's view is wrong for four reasons.

19 First, the company says its expert showed that it was doing about average for a selected
20 set of utilities. However, many other utilities are doing much better, even those in South
21 Carolina. For Example, a study of energy efficiency in the Southeast by the Southern Alliance
22 for Clean energy (Energy Efficiency: the New Energy Super Hero of the Southeast, August 7,

2012) found that Duke Energy gets over twice the savings as SCE&G at half the cost. There is a great deal of difference between where SCE&G is and where it could be.

Second, the utility claims that energy efficiency exhibits declining marginal effectiveness. That is not the case, especially when one is starting at such a low level of performance, as the above observation on Duke indicates. Exhibit MNC -SR -7 is an excerpt from my analysis on this issue which explains why the assumption of declining effectiveness and rising costs is not correct. The text accompanying the exhibit reads as follows

[The] Exhibit shows a graph that summarizes the results of analyses of the cost of efficiency in sixteen states over various periods covering the last twenty years. The data points are the annual average results obtained in various years at various levels of energy savings. The graph demonstrates two points that are important for the current analysis.

- First, the vast majority of costs fall in the range of \$30/MWh to \$50/MWh.
- Second, the higher the level of energy savings, the lower the level of costs. There is certainly no suggestion that costs will rise at high levels of efficiency.

While the aggregate data appear to suggest a very strong downward trend, the data for individual utilities suggest a moderate downward trend. Exhibit II-1 shows the trend line for one individual utility. The trend is very slightly negative. It is among the weakest of the downward trends observed in individual states, however. (Mark Cooper, A Consumer Analysis of Energy Efficiency and Renewable Energy Standards: The Cornerstone of Consumer-Friendly Energy/Environmental Policy, May 2009, p. 14)

An explanation for declining costs for higher levels of efficiency is needed. The authors suggest that economies of scale, learning and synergies in technologies may account for the declining costs. As utilities do more of the cost effective measures, costs decline. Also, if technical potential is much higher than achievable savings, economies of scale and scope and learning could pull more measures in and lower costs.

Third, even if efficiency exhibits rising marginal costs, the current cost are so much lower than the marginal cost of supply-side options that there is a great deal of efficiency that SCE&G could pursue that is cost effective. These are issues that need to be carefully considered in the full prudence review.

1 Finally, it is important to distinguish short term from long term. In the long term the cost
2 of efficiency is likely to decline, but the history of nuclear construction is that its cost rises.

3
4 **Q. Does the failure to recognize the long-term potential for efficiency lead the company
5 to choose excessively costly approaches to carbon reduction?**

6 **A.** Yes, that is a fundamental problem with the company's approach to the analysis of
7 alternatives. Company witness Lynch (p. 13) notes that I said "the Commission cannot ignore
8 the carbon issue" and argues that "Carbon emission cost, by the way, can come as taxes, cap and
9 trade mechanisms, or mandatory capture and sequestration requirements. Each of the approaches
10 imposes costs." As I showed in my testimony (Exhibit MNC-8), the carbon abatement supply
11 curve put forward by the CEO of the nation's largest nuclear utility and the PJM ISO includes a
12 substantial amount of carbon reduction strategies that lowers the cost of electricity. This supply
13 curve also shows the flaw in company witness Byrnes suggestion (p. 12) that we need to build
14 nuclear reactors instead of bringing coal-fired capacity into compliance with new EPA
15 regulations. There are a number of lower cost alternatives to come into compliance.

16
17 **Q. Do you agree with the company's analysis of solar power?**

18 **A.** The rhetorical gimmick of calculating the number and size of installations that will be
19 needed to equal a nuclear reactor is a red herring, since no one proposes to do so. Solar is part of
20 a mix of resources that can meet future needs in a diversified portfolio. The company analysis of
21 solar power is indicative of a fundamental problem in the utility's approach to least cost
22 planning. The company's narrow tunnel vision approach to resource acquisition is ill-suited to
23 the current, complex decision making environment.

Resources that can be added at smaller scale in a shorter time period afford much greater flexibility in decision making. Because renewables can be brought online in much smaller increments more quickly, the utility should be looking at the cost of PV and other renewables for several decades. Exhibit MNC-SR-7 shows the most recent evaluation of cost trends by the California Energy Commission. The text accompanying Exhibit MNC-SR-7, reads as follows

Cost trends may be important. For example, in the California analysis projected cost for 2018 are used, since that is the first year a nuclear reactor (under extremely optimistic assumptions) could be brought online.

California projects significant cost changes over that period, as shown in [the] Exhibit... Since the technologies that are projected to decline in cost can be brought online in a much shorter period of time, the cost comparison between nuclear and the alternatives should be based on the future cost of bringing resources online in a specific year. Since the five resources that have strong trends in capital costs in the California analysis all have very low operating costs and capital costs make up a large part of their levelized cost, these trends are extremely important to take into account in decision making. These trends underscore the importance of the uncertainty analysis in the next section. Lazard shows a similar trend for solar, with solar becoming cost competitive with natural gas within the time frame in which nuclear reactors can be brought online. The Lazard analysis points out that while the costs per MWH converge for solar and gas, even taking capacity factors into account, solar power has a different pattern of availability. Therefore, gas and solar should be seen as complements, rather than substitutes, even when their prices converge. (Mark Cooper, "Least-Cost Planning For 21st Century Electricity Supply: Meeting the Challenges of Complexity and Ambiguity in Decision Making," *MARC Annual Meeting*, Rapid City South Dakota, June, 2011, pp. 34, 36)

Diversity across a large number of resources adds resilience to the portfolio of assets. By adding different technologies that rely on different resources and distributing them around the state, the utility gains resilience and reliability. The pattern of power generation evens out as diversity increases and the loss of a single facility will have much less impact.

Some renewable technologies should be evaluated at the retail consumer socket, rather than the utility wholesale busbar. Distributed applications that are likely to produce power at the peak and reduce consumer bills directly are especially attractive to consumers, as they should be

1 to the Commission. In fact, in spite of the claim that solar is so costly, others find it sufficiently
2 attractive to launch a business that helps individual ratepayers add solar. SCE&G found that
3 approach sufficiently significant to challenge such a business model in South Carolina.

4 With power bills averaging \$5,000 a month, Glenforest School was interested in
5 an ambitious solar energy project that could save the small academy big money.

6
7 A New England company told Glenforest that adding a solar component could cut
8 the West Columbia school's electricity bill by thousands of dollars. What's more,
9 the company was offering free solar panels through a federally supported project
10 that encourages renewable energy projects...

11
12 But the deal fell apart after a legal fight between central South Carolina's largest
13 power company, SCE&G, and the business marketing the solar program, DCS
14 Energy Inc. Upset with the solar company's entry into South Carolina, SCE&G
15 filed a complaint that prompted DCS to leave the state last fall. (Sammy Fretwell,
16 "Scuttled Solar Deal Leaves Churches, Charities in the Lurch," *The State*, March
17 11, 2012).

18
19 **Q. Please summarize the conclusion of your rebuttal testimony.**

20 A. In conclusion, the rebuttal testimony reinforces my opinion that the utility has not done
21 what a prudent investor and utility manager would – continually evaluate the reasonableness and
22 prudence of the project going forward in light of current conditions. The Baseload Act requires
23 the Commission to examine the prudence of the cost overruns and gives it the opportunity to
24 require the company to conduct the necessary analysis to assess whether the project itself is still
25 prudent. In my opinion, underlying regulatory principles, which were not changed by the
26 Baseload Act, also require that the company do so. The sooner the Commission orders the utility
27 to act prudently and do a forward looking assessment of the prudence of Summer Units 2 & 3,
28 the more ratepayers will save.

EXHIBITS

Fuel costs represent only about 13% of the busbar cost of nuclear generation, compared to new combined cycle gas plants, where fuel costs is still 41% of the cost of busbar cost even at today's low gas prices. March (p. 7)

Assume for argument that nuclear cost reduction equals \$313 million

Assume gas non-fuel cost reduction proportionate to nuclear non-fuel cost

$$(.59/.87) * 313 = 212$$

Assume gas non-fuel cost reduction proportionate to total nuclear cost

$$(.59/1.0) * 313 = 185$$

Levelized cost is often cited as a convenient summary measure of the overall competitiveness of different generating technologies. Levelized cost represents the present value of the total cost of building and operating a generating plant over an assumed financial life and duty cycle, converted to equal annual payments and expressed in terms of real dollars to remove the impact of inflation. (EIA, Annual Energy Outlook, 2011, http://www.eia.gov/oiaf/aeo/electricity_generation.html).

Levelized cost is often cited as a convenient summary measure of the overall competitiveness of different generating technologies. It represents the per-kilowatt hour cost (in real dollars) of building and operating a generating plant over an assumed financial life and duty cycle (EIA, Annual Energy Outlook, 2012, http://www.eia.gov/forecasts/aeo/pdf/electricity_generation.pdf).

Exhibit H JML-2, p. 9, 11.

The following table shows the results of an economic analysis using SCE&G's baseline assumptions.

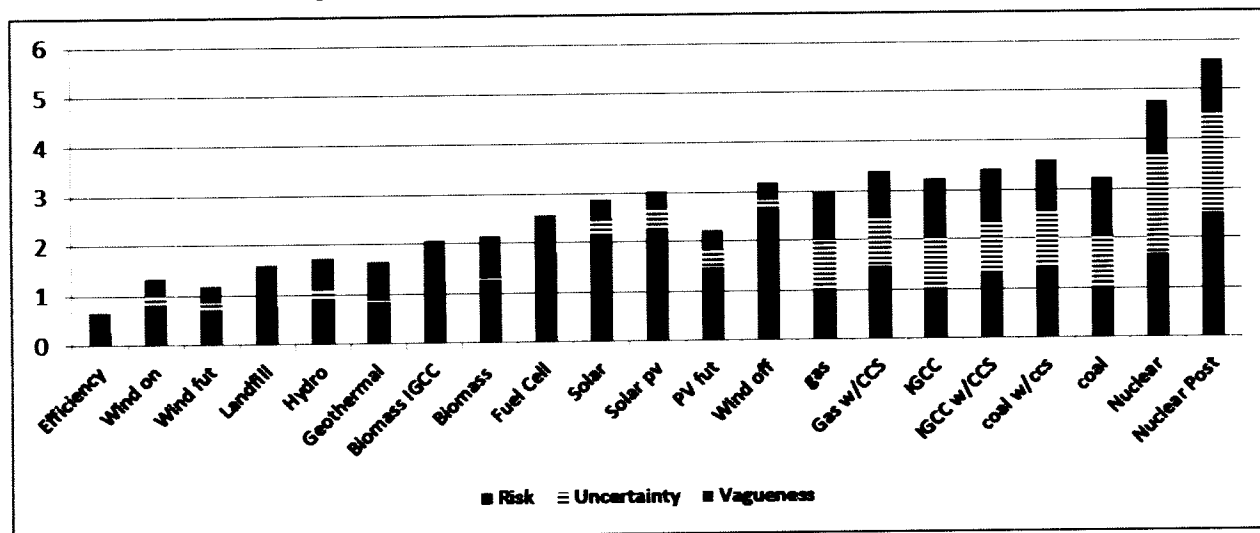
Levelized Present Value of Comparative Revenue Requirements (\$Million Per Year) – Shown as Change from the Nuclear Strategy	CO ₂ at \$15	CO ₂ at \$30	High Natural Gas Prices
1) Nuclear Strategy	-	-	-
2) Gas Strategy	15.1	125.2	68.5
3) Coal Strategy	94.9	267.5	99.0

Note: Revenue includes production costs for all plants and the capital costs of all new plants.

The nuclear strategy is seen to be the lowest cost option for SCE&G's customers over the long run. Cost here is measured in terms of the impact on SCE&G's customers' bills and is quantified in the table as the levelized present value of comparative revenue requirements. Comparative revenue requirements refer to all fixed and variable production costs from all of the power plants plus the capital costs from all of the incremental power plants. Each of the three strategies

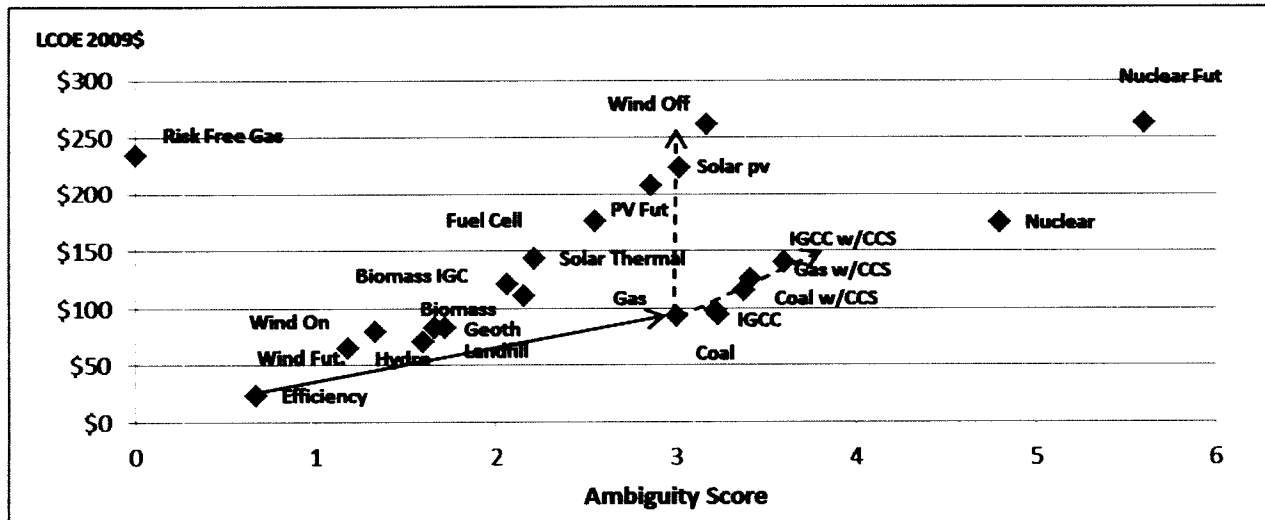
The table below shows the sensitivity of the economic results to the price of a CO₂ credit. For each combination of escalation rate and CO₂ price in 2012, the table shows the approximate difference in levelized revenue requirements between the nuclear strategy and the gas strategy. For example, if the CO₂ price in 2012 is \$20 and escalates at 5% per year, then the nuclear strategy would save SCE&G's customers about \$19 million per year on a levelized basis. On the other hand if the CO₂ price were only \$5 escalating at 2%, then the nuclear strategy would cost about \$71 million more per year than the gas strategy. The shaded area highlights the combinations of CO₂ price and escalation which result in the gas strategy being more economical than the nuclear strategy.

Change in Levelized Rev. Req.: Gas Strategy Minus Nuclear Strategy Positive Entries Represent Nuclear Advantage in Millions of Dollars											
CO ₂ Price / Escalation	\$0	\$5	\$10	\$15	\$20	\$25	\$30	\$35	\$40	\$45	\$50
0%	-87	-75	-63	-51	-40	-28	-16	-5	7	19	31
2%	-87	-71	-55	-39	-23	-7	9	25	41	57	73
4%	-87	-64	-42	-20	2	24	47	69	91	113	135
5%	-87	-60	-34	-7	19	45	72	98	124	151	177
6%	-87	-55	-24	8	39	71	102	134	165	197	228
8%	-87	-41	5	50	96	141	187	233	278	324	369
10%	-87	-19	48	116	183	250	318	385	453	520	587

EXHIBIT III-7: THE SEQUENCE OF RESOURCE ACQUISITION IN AN AMBIGUOUS ENVIRONMENT

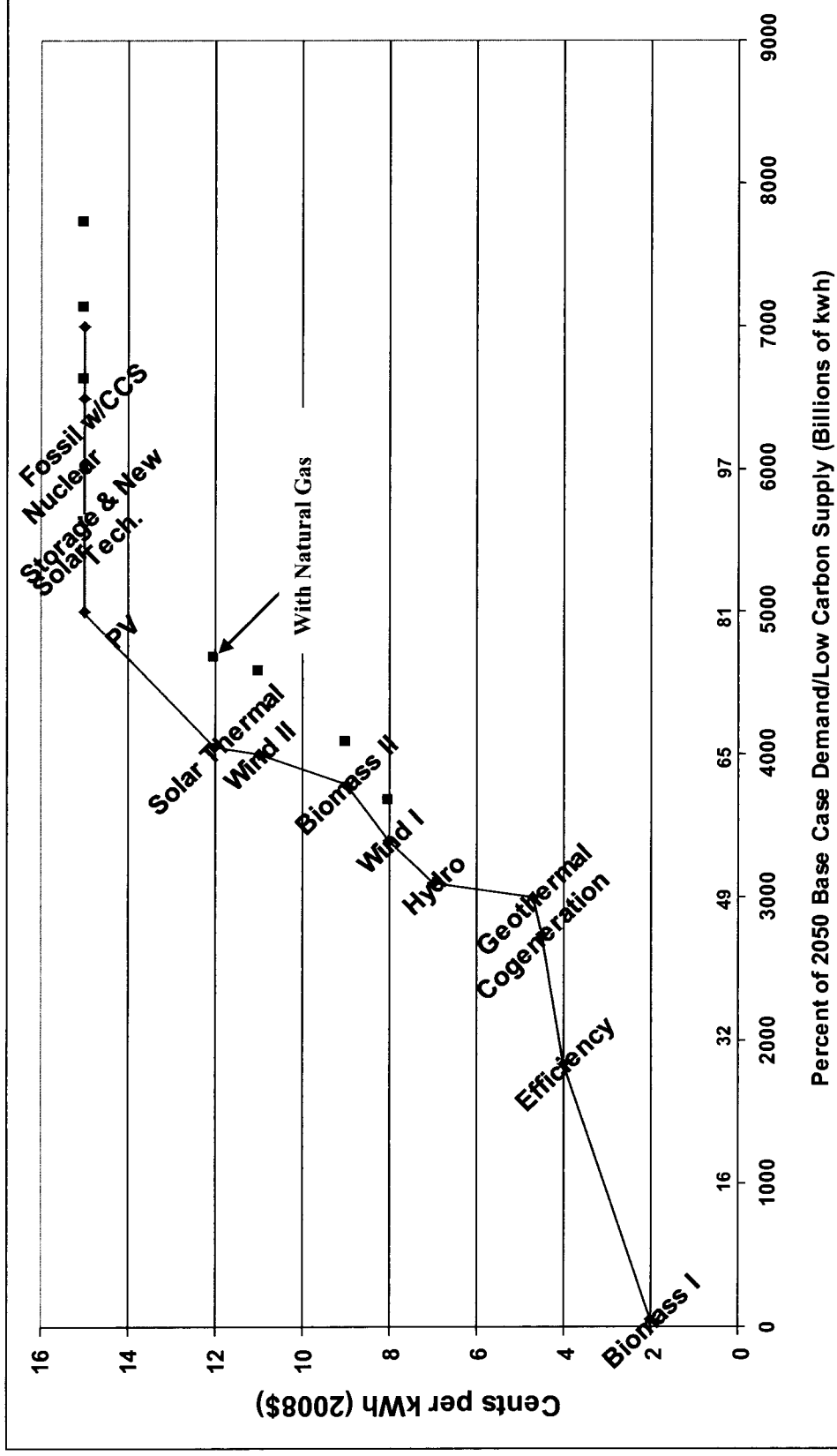
Source: Mark Cooper, "Prudent Resource Acquisition in a Complex Decision Making Environment: Multidimensional Analysis Highlights the Superiority of Efficiency, Current Approaches to Integrated Resource Planning," *2011 ACEEE National Conference on Energy Efficiency as a Resource*, Denver, September 26, 2011

EXHIBIT ES-7: AMBIGUITY AND LEVELIZED COST: A ROAD MAP FOR RESOURCE ACQUISITION



Source: Mark Cooper, "Least-Cost Planning For 21st Century Electricity Supply: Meeting the Challenges of Complexity and Ambiguity in Decision Making," *MARC Annual Meeting*, Rapid City South Dakota, June, 2011

Figure V-9: Electricity Supply Curve in a Carbon Constrained Environment

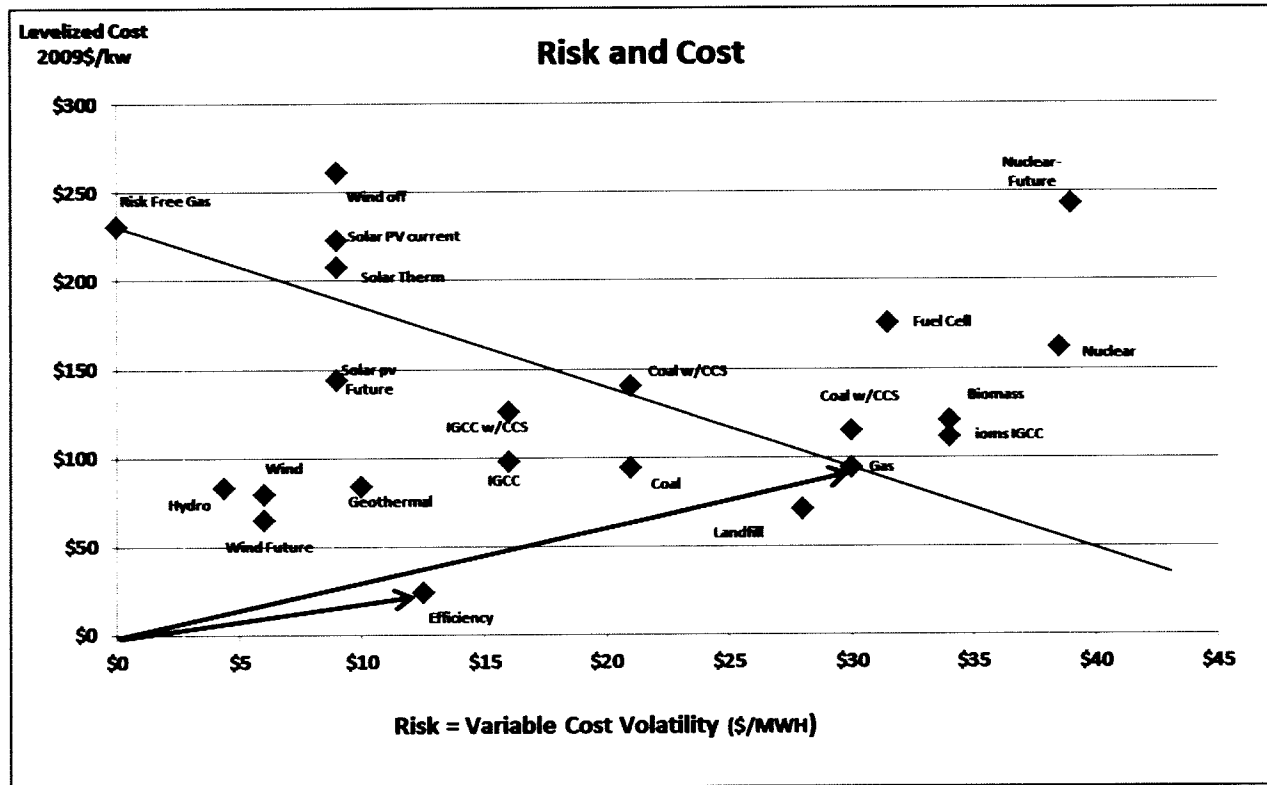


Mark Cooper, *The Economics of Nuclear Reactors: Renaissance of Relapse*, Institute for Energy and the Environment, Vermont Law School, June 2009,

[HTTP://WWW.VERMONTLAW.EDU/DOCUMENTS/COOPER%20REPORT%20ON%20NUCLEAR%20ECONOMICS%20FINAL%5B1%5D.PDF](http://www.vermontlaw.edu/documents/cooper%20report%20on%20nuclear%20economics%20final%5B1%5D.pdf)

5D.PDF

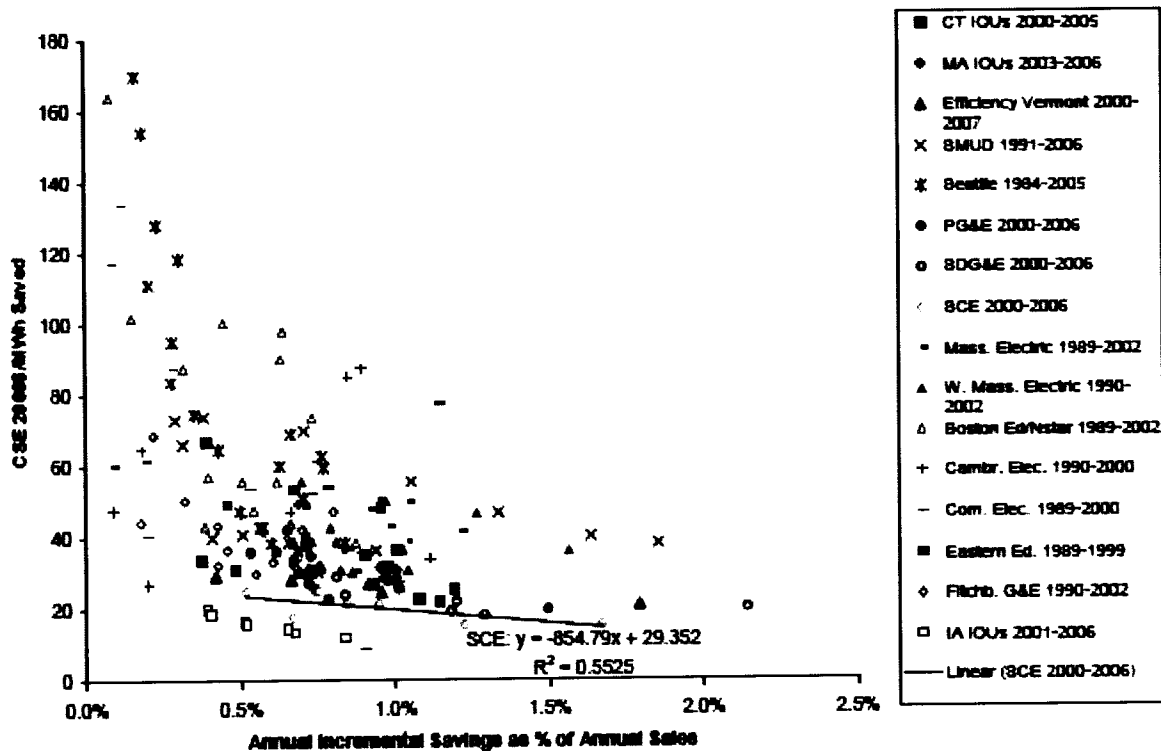
EXHIBIT III-2: RISK: AVERAGE LEVELIZED COST V. VARIABLE COST



Source: Lazard, *Levelized Cost of Energy Analysis - Version 4.0, June 2010*, California Energy Commission, *Comparative Cost of Central Station Electricity Generation*, January 2010. EIA, *Annual Energy Outlook: 2011, Levelized cost of New Electricity Generating Technologies*, is used to provide the second estimate in the case of Lazard hydro, Lazard wind-off, CEC, coal w/CCS, coal.

Exhibit II-1

Figure 2. Utility Cost of Saved Energy (2006\$/MWh) vs. Incremental Annual Savings as % of Sales

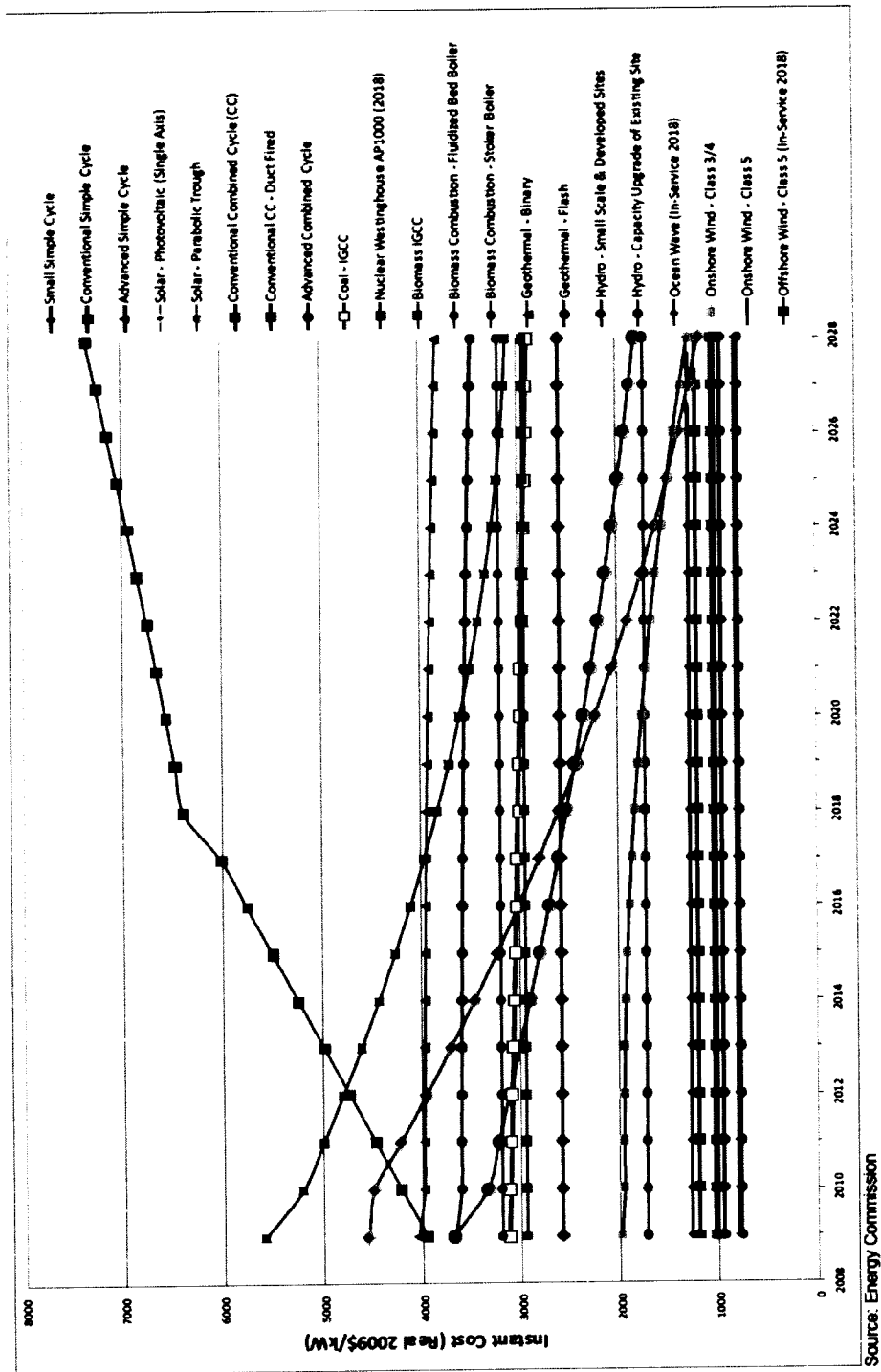


Source:

Mark Cooper, *A Consumer Analysis of Energy Efficiency and Renewable Energy Standards: The Cornerstone of Consumer-Friendly Energy/Environmental Policy*, May 2009, based on Kenji Takahasi and David Nichols, "Sustainability and Costs of Increasing Efficiency Impact: Evidence from Experience to Date," *ACEE Summer Study on Energy Efficient Buildings* (Washington, D.C., 2008), p. 8-363.

EXHIBIT IV-2: CEC OVERNIGHT COST TRENDS

Figure 3: Average Instant Cost Trend (Real 2009 \$/kW)



Source: Energy Commission

Comparative Cost of California Central Station Electricity Generation, 2010, <http://www.energy.ca.gov/2009publications/CEC-200-2009-017/CEC-200-2009-017-SF.PDF>